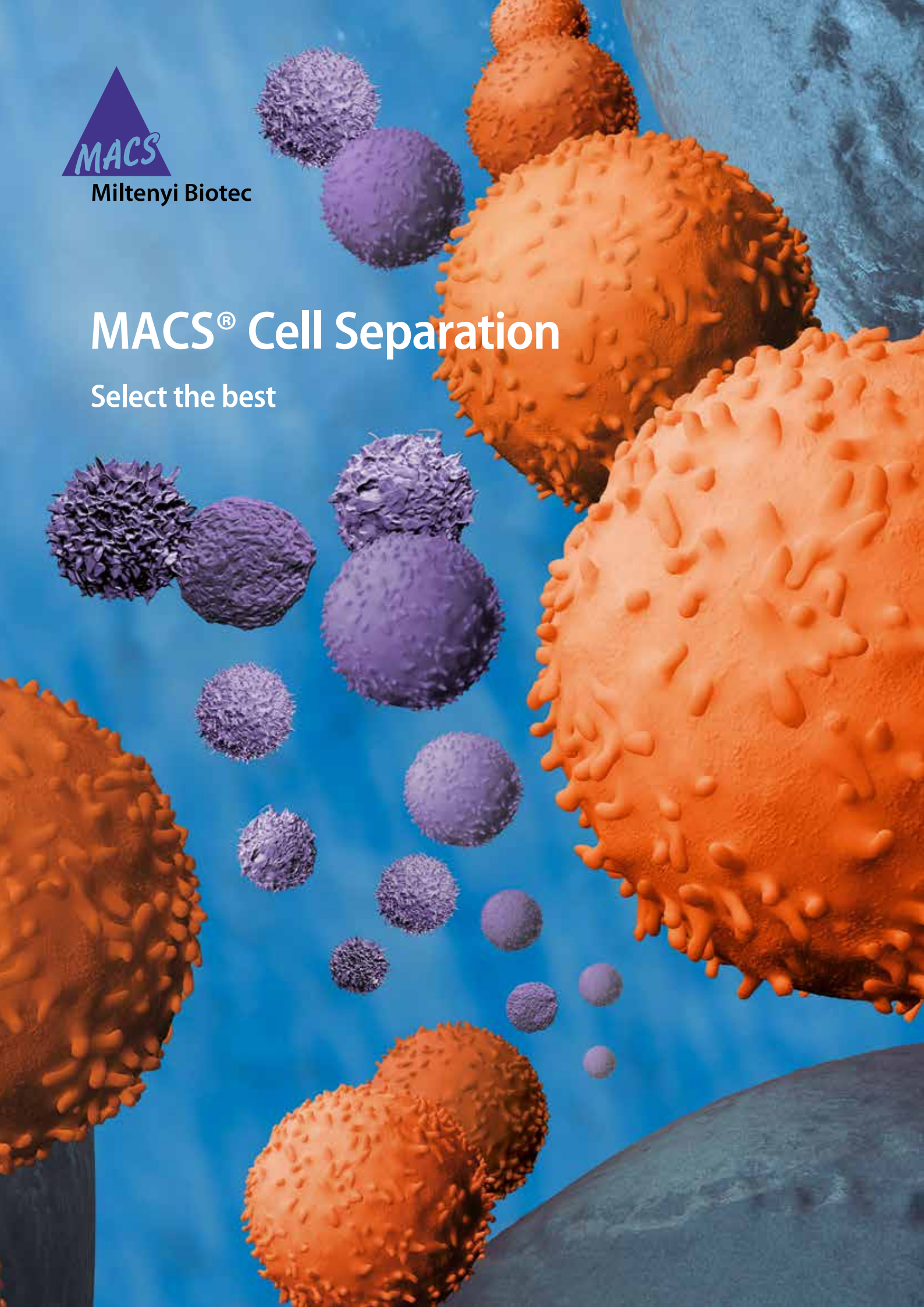




Miltenyi Biotec

MACS[®] Cell Separation

Select the best



MACS® Technology

One portfolio for all your cell isolation needs

With the MACS® Technology portfolio, you enjoy the freedom to choose the cell isolation option that's best for your specific requirements, with absolute flexibility and confidence. What makes the MACS Technology portfolio so unique? It combines our proven magnetic cell isolation technology with new expanding options – giving you cell isolation solutions across basic and clinical research.

We are excited about the unsurpassed possibilities our portfolio has to offer. Choose between our column-based technology using nano-sized beads and our column-free technology based on micro-sized beads. Read on to explore how MACS Technology can transform your research.

MACS® Columns

See what makes MACS® MicroBead Technology the most-cited cell isolation technology.



[See page 4](#)

Nano-sized beads, together with columns

Learn about the advantages of MACS MicroBead Technology – tested and trusted.



[See page 6](#)

Micro-sized beads

Use MACSxpress® Technology to isolate cells directly from whole blood, without density gradient centrifugation and erythrocyte lysis.



[See page 9](#)

Methods for cell isolation

Choose the right cell isolation method for your specific needs.



[See page 10](#)

	Nano-sized beads	Micro-sized beads
Benefits	<ul style="list-style-type: none"> The most comprehensive cell isolation technology available Applicable to virtually any species or sample material Limitless range of use – from basic research to clinical applications 	<ul style="list-style-type: none"> Cell isolation from whole blood within 20 minutes No density gradient centrifugation High reproducibility due to minimal sample handling
Components	<ul style="list-style-type: none"> MACS Columns MACS Separators MACS MicroBeads 	<ul style="list-style-type: none"> MACSxpress® Separator MACSxpress Beads
Starting material	<ul style="list-style-type: none"> PBMC Whole blood Bone marrow Single-cell suspensions from tissues 	<ul style="list-style-type: none"> Whole blood
	MACS MicroBead Technology	MACSxpress Technology

MACS® Columns

The most gentle way to isolate your target cells

The MACS® Column advantage

At the heart of MACS® MicroBead Technology is the MACS Column, the vessel for our patented ferromagnetic matrix for cell isolation. Designed and manufactured to deliver maximum purity and yield of viable cells, the MACS Column and matrix provide the solution for any sample type or volume.

- Minimal cell labeling with nano-sized MicroBeads is sufficient to isolate cells effectively.
- Gentle to cells as they can freely flow through.
- Facilitates translation into clinical setting. CliniMACS® CD34 Reagent System, FDA approved in the US, is based on MACS MicroBead Technology.

Explore the possibilities

We have matrix-based separation strategies for all sample sizes and types.

- Enjoy all the benefits in low-throughput experiments with our manual systems.
- Choose functional design for a high-throughput setup with the MultiMACS™ Cell24 Plus Separator.
- Get highest convenience with the autoMACS® Pro Separator.

Discuss your specific application with a local technical representative for a customized recommendation.

Find the separation strategy that fits you at www.miltenyibiotec.com/separation-strategies

Manual MACS® Separators

Manual cell separation of up to eight samples in parallel that is easy to use and simple to incorporate into any lab.

autoMACS® Pro Separator

Fully automated cell separation for increased sample throughput and reproducibility.

MultiMACS™ Cell24 Separator Plus

Semi-automated separation of up to 24 samples in parallel for fast, high-quality cell separations compatible with your cell separation strategy.

Robotic integration

Integrated cell separation solutions to simplify complex workflows with robotic assistance.

Figure 1: From MACS Manual Separators to fully robotic integration of MACS Instruments into your liquid handling system, the MACS Column and matrix enable fast and effective cell isolation to support your research.

MACS® Columns

Maximal magnetic power for minimal cell labeling

Column-based MACS® Technology allows for minimal cell labeling with nano-sized beads

Advantage of column-based technology

MACS® MicroBead Technology
High gradient of magnetic force

Minimal labeling suffices

Benefits of minimal labeling

- No non-specific labeling
- No cell activation
- No alteration of characteristics

Disadvantages of column-free technologies

Competing column-free technology
Low gradient of magnetic force

Massive labeling required

Consequences of massive labeling

- Non-specific labeling
- Cell activation
- Alteration of characteristics

Figure 2: Human PBMCs were either labeled with MACS MicroBeads for the isolation of T cells with a MACS Column (A) or with other nano-sized beads for column-free isolation of the same cell type (B). Scanning electron microscopy showed no visible labeling on cells isolated with MACS MicroBeads, whereas cells isolated column-free with other nano-sized beads showed massive labeling (indicated by arrows).

MACS® Columns enable gentle flow of cells. No pressure, sticking, or compression.

Column matrix
The spheres (A) are between 250 and 500 µm in size, depending on the column type.
Within the matrix, the space between the spheres is 20 times the size of lymphocytes (B).

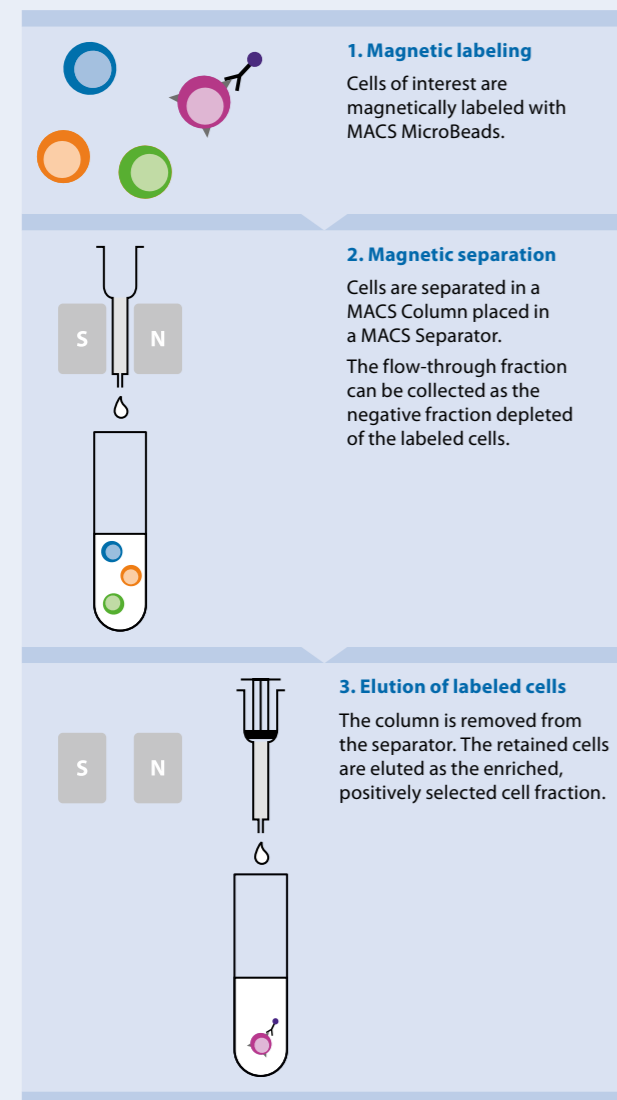
Nano-sized beads, together with columns

MACS® MicroBeads – the least manipulative isolation method

Just three easy steps

Getting a high yield of viable cells from your sample doesn't have to be complex. Simplify your workflow with MACS® MicroBead Technology. It's as easy as 1,2,3.

The three easy steps of MACS MicroBead Technology



The most flexible and gentle cell separation method

In the world of nano-sized beads there are two separation strategies, column-based and column-free. MACS MicroBead Technology owes its longstanding success to the ingenious combination of nano-sized superparamagnetic beads and a very high magnetic gradient in our MACS Columns. Only this technology ensures minimal target-specific labeling and the preservation of cell integrity and characteristics.

Nano-sized beads	
Column-based MACS Technology	<ul style="list-style-type: none"> Minimal labeling ensures preservation of cellular integrity and characteristics Truly untouched cell isolation when labeling and depleting non-target cells Isolation directly from blood with Whole Blood MicroBeads
Competing column-free technology	<ul style="list-style-type: none"> High labeling concentration Non-specific labeling and epitope blocking effects Influence on cellular integrity and characteristics

For more information on MACS MicroBead Technology isolation strategies, see www.miltenyibiotec.com/microbeads

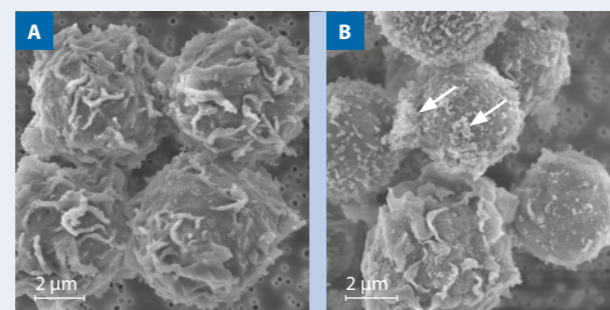


Figure 3: Features of MicroBeads and MACS Columns
Human PBMCs were labeled with MACS MicroBeads for the isolation of monocytes with a MACS Column (A) or with other nano-sized beads for column-free isolation of the same cell type (B). Scanning electron microscopy showed no visible labeling on cells or alteration of the cells' appearance when the cells were isolated with MACS MicroBeads. In contrast, cells isolated column-free with other nano-sized beads showed massive labeling (indicated by arrows) and an altered visual appearance.

Nano-sized beads, together with columns

Trust your results

Positive selection with MACS® Technology: minimize unwanted effects on target cells

The high magnetic gradient generated by the matrix in the MACS® Column allows for minimal labeling of target cells with nano-sized MicroBeads. This ensures that plenty of surface epitopes remain free for subsequent fluorescent staining and flow cytometry analysis (fig. 4).

Moreover, low labeling concentrations and the small size of MACS MicroBeads prevent the activation of target cells (fig. 5).

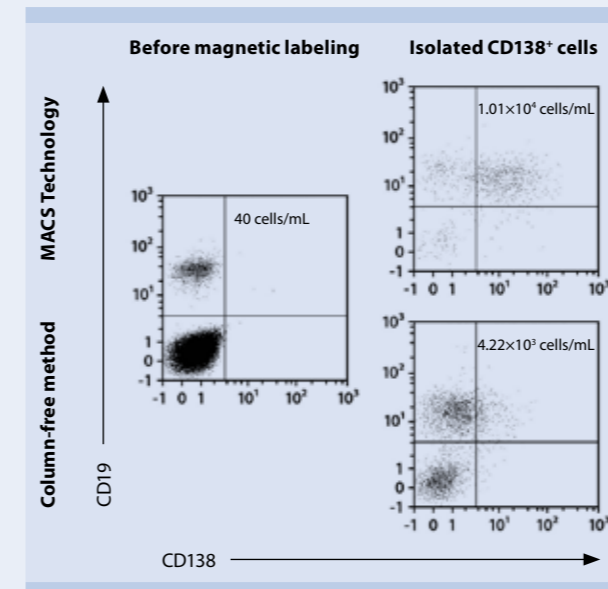


Figure 4: CD138⁺ cells were isolated from 4 mL of whole blood with CD138 Whole Blood MicroBeads and a MACS Column (upper right) or other nano-sized beads and a column-free method (lower right) according to the manufacturers' instructions. The original whole blood sample (left) and isolated cells (right) were stained for CD45, CD19, and CD138 and analyzed by flow cytometry. Only the cells isolated with MACS MicroBeads could be analyzed reliably for CD138.

We care about your downstream applications. This is why minimal cell labeling matters to us.

- Direct use in any downstream application
- Maintenance of cell characteristics
- Translation from research to clinical applications

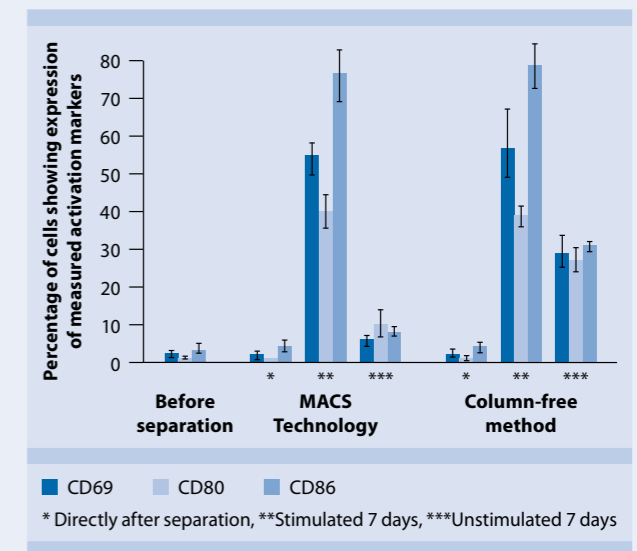


Figure 5: Human B cells were enriched using MACS CD19 MicroBeads or a column-free positive selection method from another manufacturer. Subsequently, cells were cultured for 7 days in the presence or absence of the B cell stimulation reagents CD40-Ligand/Anti-His antibody and IL-4. Activation markers, i.e., CD69, CD80, and CD86, were measured by flow cytometry directly after cell isolation and after cultivation with and without stimulation.

Depletion of unwanted cells with MACS® Technology: the only method to isolate truly untouched cells

Depletion of unwanted cells with MACS® MicroBead Technology is an elegant way to obtain pure untouched target cells. Minimal labeling of the unwanted cells with MACS MicroBeads avoids non-specific labeling of target cells, leaving the target cells truly untouched. In contrast, column-free methods using nano-sized beads require high concentrations of labeling reagents thus risking non-specific labeling of the target cell fraction (fig. 6).

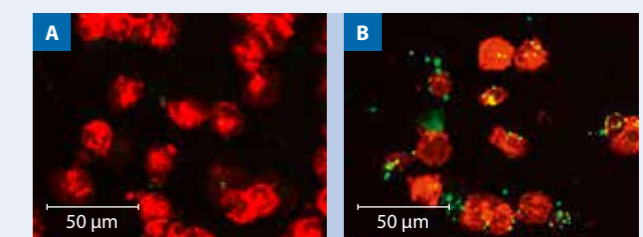


Figure 6: Monocytes were enriched by depletion of unwanted cells using the MACS Monocyte Isolation Kit II, human or a column-free kit for human monocyte isolation from another manufacturer. Subsequently, monocytes enriched with the column-based (A) or column-free (B) isolation method were stained with CD14/CD16 antibodies (red) and Anti-Dextran antibodies staining nano-sized beads (green) for immunofluorescence microscopy.

Nano-sized beads, together with columns

Choose the right bead for your application

MACS® MicroBead Technology – based on the most trusted beads in research and clinical applications

Column-based MACS® MicroBead Technology gives you the most flexible, most proven technique for cell separation.

- Isolation of frequently occurring or rare cell types
- Proven technology for basic research and clinical applications
- Used in over 35,000 clinical cellular treatments to date

Reduce debris for high-quality results with UltraPure MicroBeads

UltraPure MicroBeads are suited for standard cell isolations, including rare cell populations. Their unique formulation provides compelling benefits particularly when starting with debris-rich sample material.

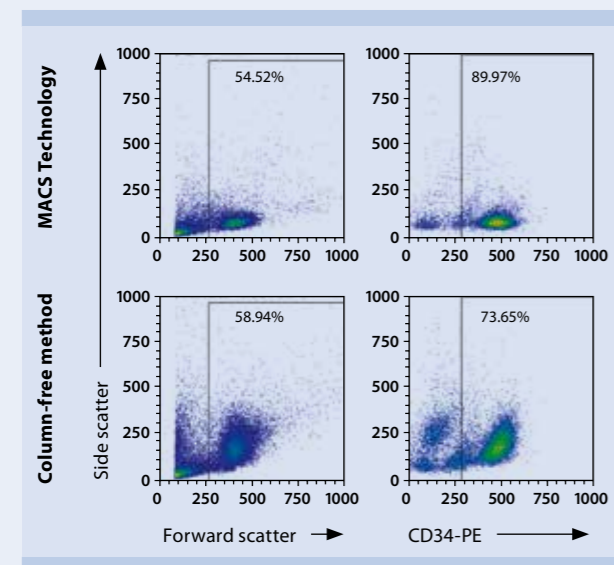


Figure 7: CD34⁺ cells were isolated with the column-based CD34 MicroBead Kit UltraPure (upper panel) or with a column-free positive isolation method from another manufacturer (lower panel). The cell population purified with MACS MicroBeads UltraPure showed greatly reduced amounts of debris and less dead cells compared to the column-free method.

Whole Blood MicroBeads – the fast and convenient way to isolate your target cells

By using MACS Whole Blood MicroBeads for your cell isolation, you eliminate erythrocyte lysis and density gradient centrifugation steps.

The streamlined procedure minimizes the number of hands-on steps, resulting in higher recovery of viable cells in less time. Additionally, by removing the centrifugation step, you benefit from greater operator safety when working with untested blood samples. Moreover, Whole Blood MicroBeads can also be used for cell isolation directly from bone marrow samples.

- Gentle on cells for a higher yield of viable cells
- Enables safe handling of hazardous biological samples
- Streamlined protocol is easy and saves time

Purified cells are suitable for further downstream analyses, including flow cytometry, cell sorting, and *in vitro* assays.

Whole Blood MicroBeads are available for CD3⁺, CD4⁺, CD8⁺, CD14⁺, CD15⁺, CD19⁺, CD33⁺, CD45⁺, CD56⁺, CD66b⁺, and CD138⁺ cells.

Fully automated separation of whole blood samples

Automated cell isolation from whole blood samples using the MACS Whole Blood MicroBeads and the autoMACS® Pro Separator provides a standardized procedure for reliable, user-independent results.

Convenient features such as autolabeling, sensor-controlled processing, and automated startup, shutdown, and cleaning steps enable true walk-away cell separation. Sample volumes of 0.25–15 mL are processed with ease.

► miltenyibiotec.com/wholeblood

Micro-sized beads

The fast track to your target cells

MACSxpress® Technology – with high speed from whole blood to your target cells

MACSxpress® Technology enables the fastest large-scale isolation of cells from whole blood – without the need for any centrifugation. Micro-sized MACSxpress Beads allow for minimal labeling to prevent non-specific labeling and activation of target cells (fig. 8).

Non-target cells are removed by immunomagnetic depletion. Simultaneously, erythrocytes are sedimented to yield target cells of exceptional purity.

- Go from whole blood to pure cells within 20 minutes
- No centrifugation required
- Minimal labeling prevents activation of target cells

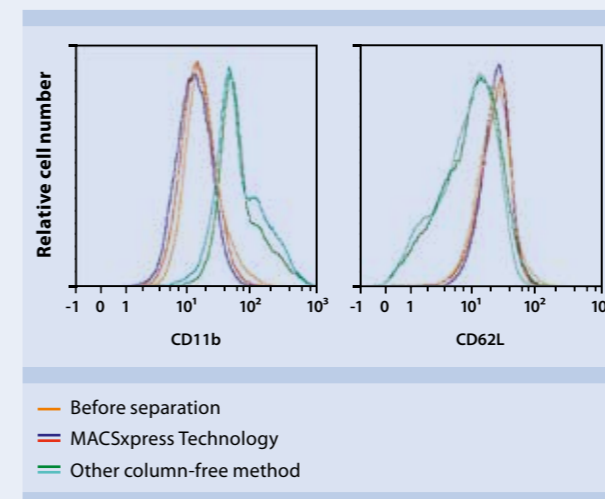


Figure 8: Neutrophils were either enriched with the MACSxpress Isolation Kit and a MACSxpress Separator or with another column-free cell isolation kit, based on nano-sized beads, for untouched isolation of neutrophils. Before and after separation, the cells were labeled with antibodies against CD11b and CD62L and analyzed by flow cytometry. MACSxpress Beads did not alter the status of the untouched target cells, whereas the column-free method from another manufacturer led to the activation of neutrophils.

► miltenyibiotec.com/macsexpress

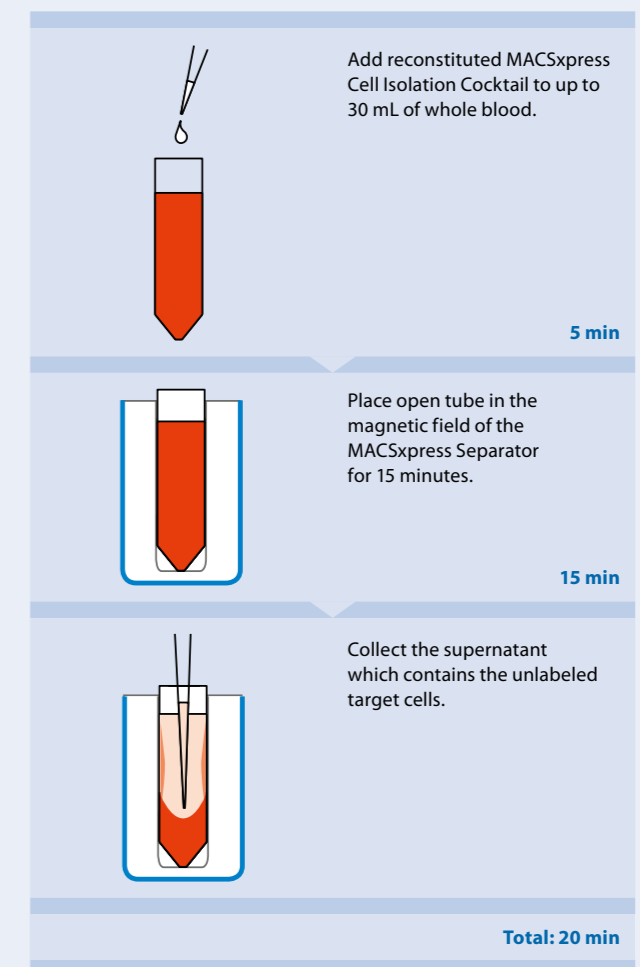


Figure 9: The basic principle of MACSxpress Technology.

Get the advantage with MACS® Technology

Choose the cell isolation method that fits you best

Nano-sized beads

	Positive cell selection (target cells are labeled)	Untouched cell isolation strategy (non-target cells are labeled)
Column-based MACS® Technology	<ul style="list-style-type: none"> Minimal labeling No effects on cell characteristics 	<ul style="list-style-type: none"> No non-specific labeling of untouched cells No effects on cell characteristics
Column-free technology	<ul style="list-style-type: none"> Massive labeling Effects on cell characteristics 	<ul style="list-style-type: none"> Non-specific labeling of untouched cells Effects on cell characteristics

Micro-sized beads

	Positive cell selection (target cells are labeled)	Untouched cell isolation strategy (non-target cells are labeled)
MACSxpress® Technology	<ul style="list-style-type: none"> Not applicable for positive selection due to cell activation 	<ul style="list-style-type: none"> Fast and convenient cell isolation with MACSxpress Technology No activation of target cells

We're there for you – just one click away!

Miltenyi Biotec offers comprehensive technical support for both new and advanced users alike.

Our technical support team is composed of experienced scientists from various fields. You can also reach them at your convenience by e-mail, phone, or online in our forums and Live Chat. No question is too big or small.



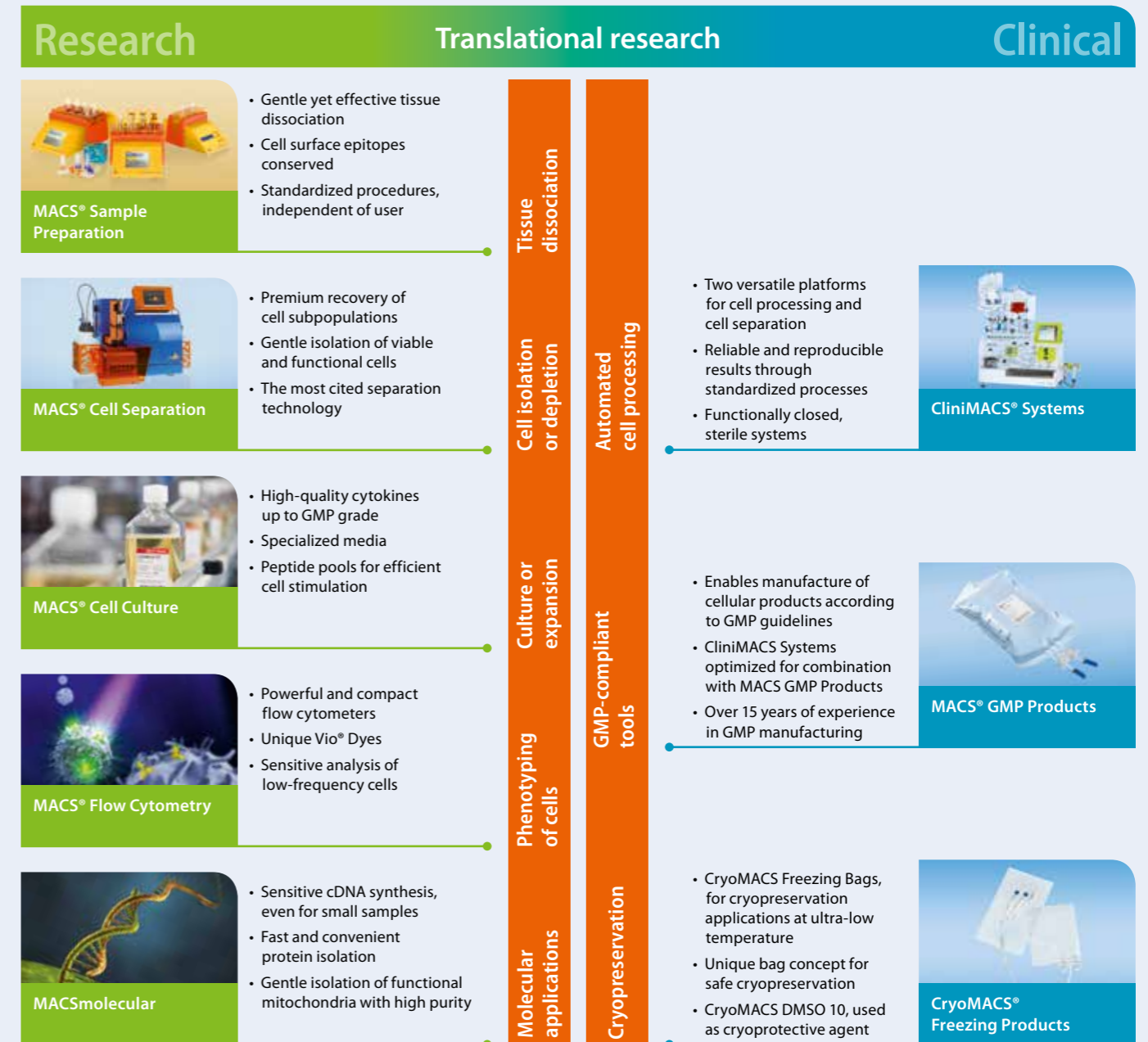
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Advanced solutions for basic research and clinical applications



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MACS

Miltenyi Biotec

**Germany/Austria/
Switzerland**

Miltenyi Biotec GmbH
Friedrich-Ebert-Straße 68
51429 Bergisch Gladbach
Germany
Phone +49 2204 8306-0
Fax +49 2204 85197
macs@miltenyibiotec.de

USA/Canada

Miltenyi Biotec Inc.
2303 Lindbergh Street
Auburn, CA 95602, USA
Phone 800 FOR MACS
Phone +1 530 888 8871
Fax +1 877 591 1060
macs@miltenyibiotec.com

Australia

Miltenyi Biotec
Australia Pty. Ltd.
Unit 16A, 2 Eden Park Drive
Macquarie Park NSW 2113
Australia
Phone +61 2 8877 7400
Fax +61 2 9889 5044
macs@miltenyibiotec.com.au

Benelux

Miltenyi Biotec B.V.
Schipholweg 68 H
2316 XE Leiden
The Netherlands
macs@miltenyibiotec.nl

**Customer service
The Netherlands**

Phone 0800 4020120
Fax 0800 4020100

Customer service Belgium

Phone 0800 94016
Fax 0800 99626

Customer service Luxembourg

Phone 800 24971
Fax 800 24984

China

Miltenyi Biotec Technology &
Trading (Shanghai) Co., Ltd.
Room 2309
No. 319, Xianxia Road
Changning District
200051 Shanghai, P.R. China
Phone +86 21 62351005
Fax +86 21 62350953
macs@miltenyibiotec.com.cn

France

Miltenyi Biotec SAS
10 rue Mercœur
75011 Paris, France
Phone +33 1 56 98 16 16
Fax +33 1 56 98 16 17
macs@miltenyibiotec.fr

Italy

Miltenyi Biotec S.r.l.
Via Persicetana, 2/D
40012 Calderara di Reno (BO)
Italy
Phone +39 051 6 460 411
Fax +39 051 6 460 499
macs@miltenyibiotec.it

Japan

Miltenyi Biotec K.K.
Nittsu-Eitai Building 5F
16-10 Fuyuki, Koto-ku,
Tokyo 135-0041, Japan
Phone +81 3 5646 8910
Fax +81 3 5646 8911
macs@miltenyibiotec.jp

Nordics and Baltics

Miltenyi Biotec Norden AB
Scheelevägen 17
223 70 Lund
Sweden
macs@miltenyibiotec.se
Customer service Sweden
Phone 0200-111 800
Fax 046-280 72 99

Customer service Denmark

Phone 80 20 30 10
Fax +46 46 280 72 99

**Customer service
Norway, Finland, Iceland,
and Baltic countries**

Phone +46 46 280 72 80
Fax +46 46 280 72 99

Singapore

Miltenyi Biotec Asia Pacific Pte Ltd.
100 Beach Road
#28-06 to 28-08 Shaw Tower
Singapore 189702
Phone +65 6238 8183
Fax +65 6238 0302
macs@miltenyibiotec.com.sg

South Korea

Miltenyi Biotec Korea Co., Ltd
Arigi Bldg. 8F
562 Nonhyeon-ro
Gangnam-gu
Seoul 06136, South Korea
Phone +82 2 555 1988
Fax +82 2 555 8890
macs@miltenyibiotec.co.kr

Spain

Miltenyi Biotec S.L.
C/Luis Buñuel 2
Ciudad de la Imagen
28223 Pozuelo de Alarcón (Madrid)
Spain
Phone +34 91 512 12 90
Fax +34 91 512 12 91
macs@miltenyibiotec.es

United Kingdom

Miltenyi Biotec Ltd.
Almac House, Church Lane
Bisley, Surrey GU24 9DR, UK
Phone +44 1483 799 800
Fax +44 1483 799 811
macs@miltenyibiotec.co.uk

www.miltenyibiotec.com

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